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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 0504

Application Number: 09/382,442
Filing Date: August 25, 1999
Appellant(s): REINBERG, ALAN R.

Janal M. Kalis
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 3/18/04.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 1-2 and 4-14 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

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9419829	LISENKER ET AL.	09-1994
5,397,724	NAKAJIMA ET AL.	03-1995
4,840,917	SHEU	06-1989

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-5, and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakanishi, U.S. Patent 5,145,797 in view of Lisenker et al., WO 94/19829 and further in view of Admitted prior art.

Nakanishi shows the invention substantially as claimed including providing a semiconductor layer 1 having a surface; heating the layer in an atmosphere during thermal oxidation wherein hydrogen is inherently incorporated into the layer; fabricating a memory circuit having a programming operation and an erasing operation, comprising single bit data using the semiconductor layer 1, the fabricating comprising fabricating a gate region-3 in the layer; treating a portion of the surface to form a thin layer 7 of insulator film adjacent to the gate region and under the gate region and forming a second gate region 5 over the first gate region (see figs. 1A-1D and col. 2-lines 28-66).

Nakanishi fails to expressly disclose heating the layer in an atmosphere comprising a hydrogen isotope wherein the hydrogen isotope is incorporated into the layer; and heating the gate region and the thin layer in an atmosphere comprising a hydrogen isotope.

Admitted prior art discloses performing a post-metal passivation process using hydrogen (see page 4, lines 27-30 of specification). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Nakanishi so as to perform a post-metal passivation process so as to heat the gate region and thin layer using hydrogen as suggested by the admitted prior art because such a process is commonly used and suitable for reducing defects in completed devices. Additionally, Lisenker et al. discloses replacing hydrogen with deuterium in a polysilicon deposition process or in a passivation process or in any process in which hydrogen is employed (see paragraph bridging pages 8-9). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Nakanishi so that the deposition of the polysilicon layers 3 and 5 and the heating process is employed using deuterium as suggested by Lisenker et al. and produce a memory device wherein single bit data loss is reduced and wherein random single bit data loss is prevented in both the programming and erasing operation because bonds formed with deuterium are stronger than those formed with hydrogen (see page 9, lines 5-14).

With respect to claims 4-5, note that the thermal oxidation process recited above will be at such a temperature as to oxidize and anneal the semiconductor layer.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakanishi, U.S. Patent 5,145,797 in view of Lisenker et al., WO 94/19829 and further in view of Admitted prior art as applied to claims 1-2, 4-5, and 7-10 above, and further in view of Nakajima et al., U.S. Patent 5,397,724.

Nakanishi, Lisenker et al., and the Admitted prior art are applied as above but fail to expressly disclose subjecting the semiconductor to ammonia enriched in hydrogen isotope at an elevated temperature.

Nakajima et al. teaches the formation of a memory device in which a passivation layer 32 of silicon nitride is formed thereover by CVD (see fig. 8F and col. 7-lines 42-57). Note that it is well known in the art that silicon nitride is commonly formed through CVD using an ammonia precursor. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Nakanishi modified by Lisenker et al. and the Admitted prior art so as to subject the semiconductor to ammonia enriched in hydrogen isotope because Nakajima et al. suggests using silicon nitride as an overlying passivation layer for a memory device and Lisenker et al. teaches the desirability of replacing hydrogen with deuterium in all semiconductor processing steps.

Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakanishi, U.S. Patent 5,145,797 in view of Lisenker et al., WO 94/19829 and further in

view of Admitted prior art as applied to claims 1-2, 4-5, and 7-10 above, and further in view of Sheu, U.S. Patent 4,840,917.

Nakanishi, Lisenker et al., and the Admitted prior art are applied as above but fail to expressly disclose forming a field oxide in the substrate followed by annealing in a hydrogen isotope material at a temperature greater than 800 Celsius.

Sheu discloses forming field oxides followed by performing hydrogen annealing at 1000 Celsius in order to incorporate hydrogen into the active area (see col. 1-lines 27-35). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Nakanishi modified by Lisenker et al. and the Admitted prior art so as to form a field oxide followed by annealing with hydrogen because this reduces the surface state density of the device. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the hydrogen with deuterium as suggested by Lisenker et al. because of the stronger bonds that silicon forms with deuterium.

(11) Response to Argument

Appellant's arguments filed 3/18/04 have been fully considered but they are not persuasive. Appellant argues that the Nakanishi patent has no reference to hydrogen isotopes. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir.

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1986). Note that the Lisenker et al. reference is the reference used to show the use of hydrogen isotopes in semiconductor processing. Appellant further states that the dry oxygen atmosphere of Nakanishi does not even use hydrogen let alone a hydrogen isotope. However, as discussed by Lisenker et al. (see page 3, lines 8-24), the dry oxygen of Nakanishi unintentionally introduces hydrogen into the process so in this case it is important to replace the "unintentional" hydrogen with deuterium. Therefore, this line of argument is respectfully rejected.

Concerning the fact that Lisenker et al. does not refer to a memory cell with the claimed characteristics, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, note that Lisenker et al. does mention the group of MOS based devices (see abstract), of which a flash memory circuit is a subset. Additionally, the Nakanishi reference is relied upon to show the features of the claim related to the memory device and the modification of Nakanishi with the Admitted prior art and Lisenker et al. will render the claim obvious.

Concerning appellant's statement that Lisenker et al. suggests that deuterium treatment would not be effective in an erase operation, appellant has not pointed out which statements make this assertion. Furthermore, appellant has not pointed out how the process of Nakanishi modified by the Admitted prior art and Lisenker et al. differs from applicant's invention in such a way that deuterium treatment would be effective in an erase operation for one and not for the other.

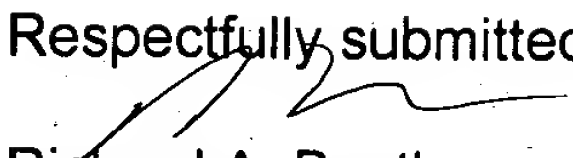
Regarding the argument of claim 6, note that the combination of Nakanishi with the Admitted prior art and Lisenker et al. teach the initial step of exposing the semiconductor layer to a hydrogen isotope. Furthermore, it would have been obvious to one of ordinary skill in the art to deposit the passivation layer 32 of Nakajima using ammonia enriched in deuterium because of the teaching of Lisenker et al. related to replacing hydrogen with deuterium because of the increased bond strength. With respect to the fact that Nakajima fails to teach the improved data retention: 1) Nakajima is not relied upon to show the hydrogen isotope 2) the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985) and 3) the fact that Nakajima may teach a heating step for improved data retention does not mean that other processing steps do not improve data retention.

Concerning appellant's arguments regarding claims 11-14, Sheu teaches annealing a field oxide in a hydrogen environment and Lisenker et al. is relied upon to show replacing the hydrogen with deuterium. Moreover, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

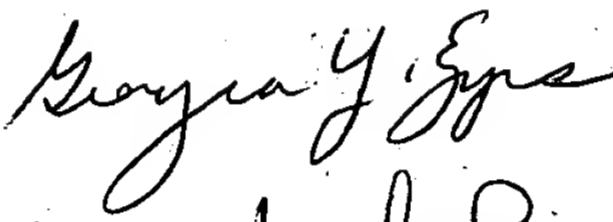

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Art Unit 2812

RAB

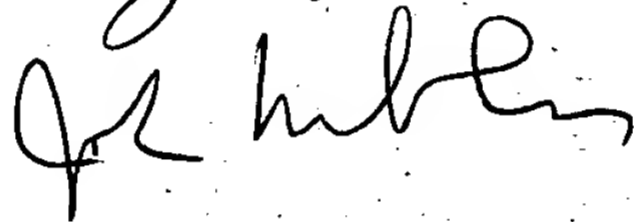
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